Abstract of the Disclosure

An apparatus 10 is provided that measures the speed of sound propagating in a multiphase mixture to determine parameters, such as mixture quality, particle size, vapor/mass ratio, liquid/vapor ratio, mass flow rate, enthalpy and volumetric flow rate of the flow in a pipe or unconfined space, for example, using acoustic and/or dynamic pressures. The apparatus includes a pair of ultrasonic transducers disposed axially along the pipe for measuring the transit time of an ultrasonic signal to propagate from one ultrasonic transducer to the other ultrasonic transducer. A signal process, responsive to said transit time signal, provides a signal representative of the speed of sound of the mixture. An SOS processing unit then provides an output signal indicative of at least one parameter of the mixture flowing through the pipe. The frequency of the ultrasonic signal is sufficiently low to minimize scatter from particle/liquid within the mixture. The frequency based sound speed is determined utilizing a dispersion model to determine the at least one parameter of the fluid flow and/or mixture.